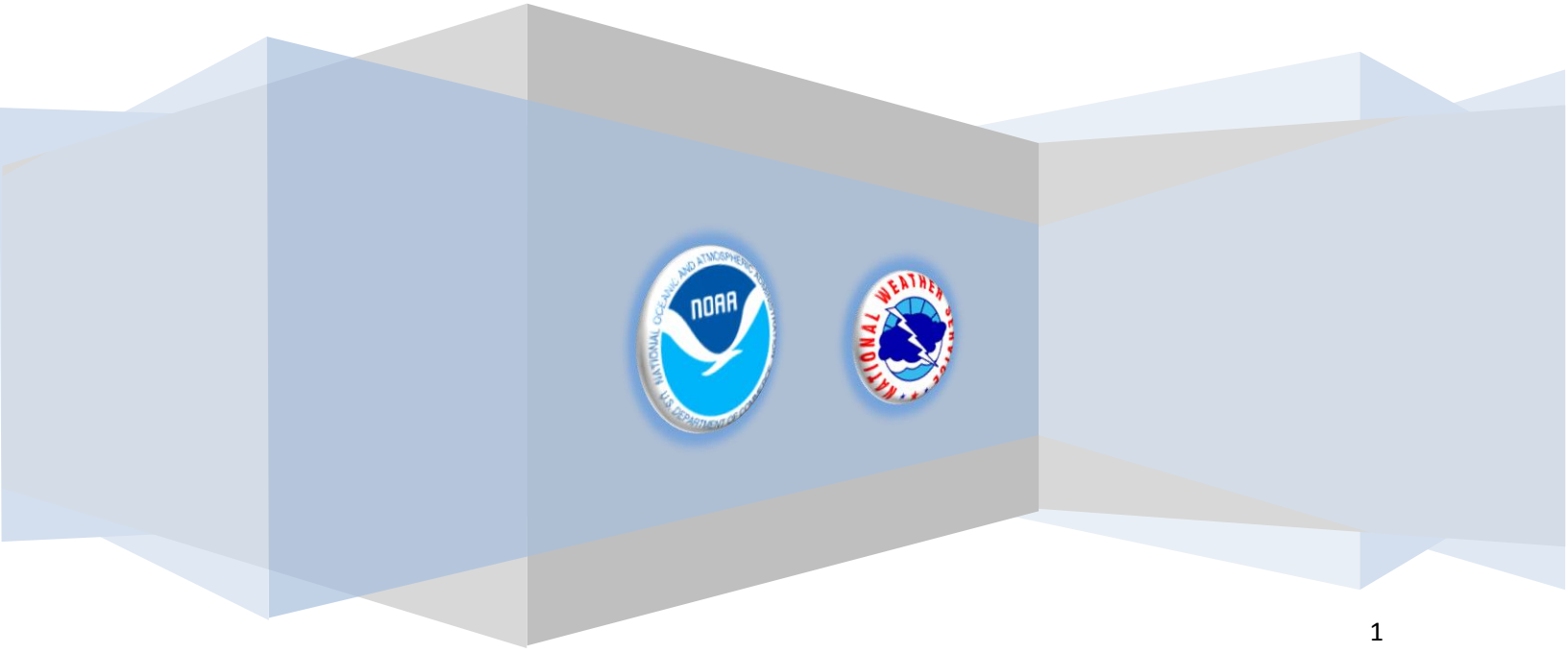
Natural Hazards Assessment

Jackson County, WI

Prepared by: NOAA / National Weather Service La Crosse, WI



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for
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Prepared by NOAA / National Weather Service – La Crosse
Last Update: November 2010

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Overview

Jackson County is in the Upper Mississippi River Valley of the Midwest with a mixture of terrain ranging from flat, wet lands (cranberry bogs) in the eastern part of the county to relatively hilly terrain in the western parts.

The area experiences a temperate climate with both warm and cold season extremes.

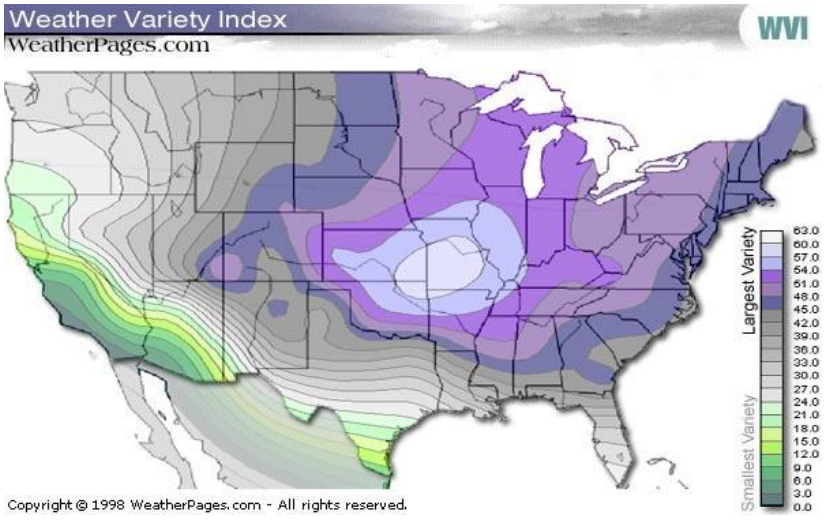
Winter months can bring occasional heavy snows, intermittent freezing precipitation or ice, and prolonged periods of cloudiness. While true blizzards are rare, winter storms impact the area on average about 3 to 4 times per season. Occasional arctic outbreaks bring extreme cold and dangerous wind chills.

Temperatures between river valleys and surrounding hill tops can vary sometimes by 3° to 5°F. This can lead to slightly more average snowfall on ridge tops and occasionally a difference in winter precipitation types from ridge to valley. Temperatures in lowlands, or bogs, are often 10 to 15 degrees colder at night and can sometimes even freeze in summer.

Thunderstorms occur on average 30 to 50 times a year, mainly in the spring and summer months. The strongest storms can produce associated severe weather like tornadoes, large hail, or damaging wind. Both river flooding and flash flooding can occur, along with urban-related flood problems. The terrain can lead to mud slides and generally increases the flash flood threat. Heat and high humidity is occasionally observed in June, July, or August.

The autumn season usually has the quietest weather. On calm nights, colder air settles into valleys leading to colder low temperatures compared to ridge top locations. High wind events can also occur occasionally, usually in the spring or fall.

The variability in weather can be seen in the following graphic, created by a private company (weatherpages.com) that rated each city on variations in temperature, precipitation, and other factors. La Crosse, WI ranked 27th highest in variability out of 277 cities.

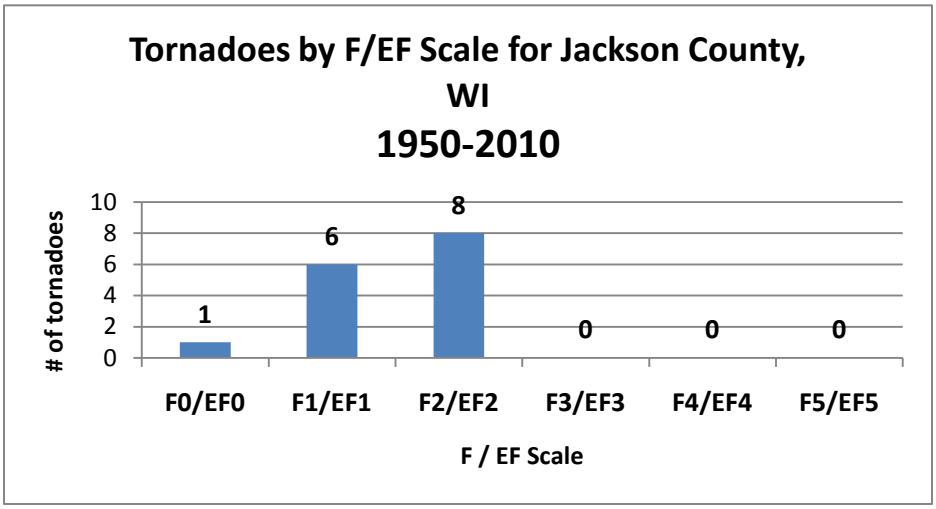


Since 1998, Jackson County has been included in a FEMA Federal Disaster Declaration 5 times:

1998 – Severe storms
2000 – Severe storms / flooding
2001 – Flooding
2004 – Severe storms / flooding
2010 – Severe storms / flooding

Tornadoes

Even though Wisconsin averages about 21 tornadoes per year, Jackson County has only had 15 tornadoes since 1950, averaging about one tornado every 4 years. Most tornadoes are short-lived and small. May and June are the peak months and most occur between 3 and 9 p.m., but they can occur nearly any time of year and at all times of the day.



Most recent tornadoes:

- July 14, 2010 (EF0*)
- June 23, 2004 (F1)
- June 23, 2004 (F1)
- Sept.13, 1994 (F1)
- July 25, 1982 (F1)
- July 18, 1971 (F2)
- June 26, 1969 (F2)
- July 10, 1966 (F2)
- July 23, 1965 (F1)
- May 23, 1964 (F2)
- May 4, 1964 (F2)
- Oct.10, 1962 (F1)

In August 1924, a killer tornado tracked along and near where Interstate 94 is currently hitting numerous buildings and at least 50 farms. Four people were killed, including a boy who was running to a storm cellar. In more recent years, a series of small tornadoes hit western and southern parts of the county in June 2004 demolishing a few buildings and shearing off hundreds of trees. There were no injuries but lots of property damage. In July 2010, a tornado moved through northern ends of the county and hit the Lake Arbutus area hard knocking down hundreds of trees.

Strongest tornadoes: (1850-2010)

- July 3, 1907 (F4) – 40 inj, 11 dead
- Aug.7, 1924 (F4) – 20 inj, 4 dead
- May 13, 1942 (F3) – 1 inj, 1 dead
- May 1, 1930 (F2) – 13 inj, 0 dead
- June 26, 1969 (F2) – 4 inj, 0 dead

Jackson County Tornado Facts:

- No F5 or EF5* tornadoes
- Only two F4 tornadoes and one F3
- 16 deaths and 85 injuries since 1850
- Tornadoes have occurred May – October
- Most have occurred in July (7)

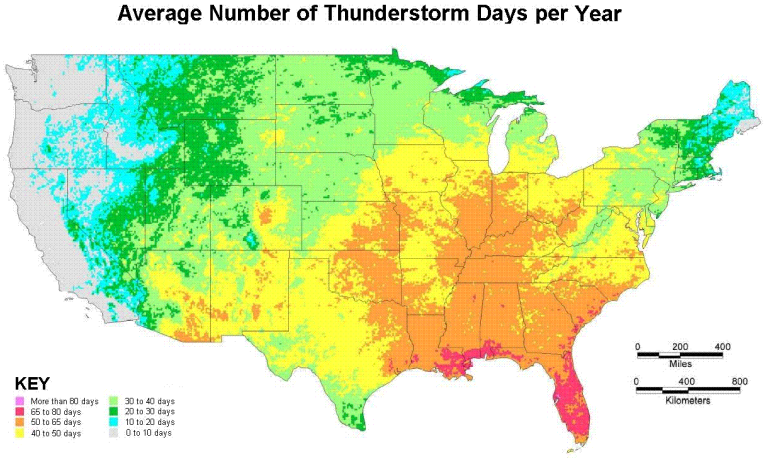
Tornado Watches		Tornado Warnings	
Year		Year	
2010	2	2010	2
2009	3	2009	0
2008	8	2008	0
2007	6	2007	2
2006	2	2006	1
2005	7	2005	2
2004	5	2004	1
2003	2	2003	0
2002	5	2002	0
2001	7	2001	0

Enhanced Fujita (EF*) Scale	
EF0	65-85 mph
EF1	86-110 mph
EF2	111-135 mph
EF3	136-165 mph
EF4	166-200 mph
EF5	>200 mph

* Started February 1, 2007

Severe Thunderstorms / Lightning

Jackson County averages 38 thunderstorm days per year. The National Weather Service (NWS) considers a thunderstorm severe when it produces wind gusts of 58 mph (50 knots) or higher, 1 inch diameter hail or larger, or a tornado.



Downdraft winds from a severe thunderstorm can produce local or widespread damage, even tornado-like damage if strong enough. Most severe thunderstorm winds occur in June or July and between the hours of 4 and 8 p.m., but can occur at other times. Most damage involves blown down trees, power lines, and damage to weaker structures (i.e. barns, outbuildings, garages) with occasional related injuries. An intense thunderstorm wind gust, or downburst, hit a field with mobile homes in August 1996 demolishing a mobile home and killing a young child. The storm also led to 4 injuries. There have been 78 damaging wind reports since 1982 in the county.

Large hail can also occur in a severe thunderstorm. June is the peak month with the most common time between 1 and 9 p.m., but it can occur in other warm season months and at any time of day. Hail is typically a crop damaging hazard but can damage roofs, windows, and vehicles if large enough (> 1”). Expenses can be high. Injuries or fatalities are rare for hail. On June 1, 2000 hail the size of softballs hit Oakdale, WI damaging siding, roofs, and numerous vehicles (see below). There have been 78 large hail (≥ 3/4”) reports in the county since 1982.

Non-severe thunderstorms still pose a lightning risk. According to the Vaisala Group, an average of nearly 300,000 cloud-to-ground strikes hit Wisconsin each year based on data from 1996 to 2005. Nationally, Wisconsin ranks 29th in lightning related fatalities with 60 deaths reported since 1959. There was a lightning fatality in Wisconsin both in 2007 and 2008, but there have been no known injuries or fatalities from lightning in Jackson County going back to 1982.

Severe Thunderstorm Watches		Severe Thunderstorm Warnings	
Year		Year	
2010	13	2010	14
2009	3	2009	7
2008	10	2008	7
2007	16	2007	8
2006	23	2006	11
2005	15	2005	11
2004	9	2004	3
2003	9	2003	2
2002	25	2002	9
2001	10	2001	4

Flooding and Hydrologic Concerns

On occasion intense, heavy rain producing thunderstorms or consecutive thunderstorms ("training") can bring excessive rainfall leading to flash flooding in Jackson County. The hilly terrain in parts of the county can enhance run-off. In the flat areas, ponding of water is more likely.

June is the most common month for flash floods, but they can occur from May through September. They are most common in the evening hours, between 8-10 p.m., but can occur at other times and typically last from 3-6 hours. Between 1982-1997, there were 8 deaths from flooding in Wisconsin.

Flash flooding hit the county in June 1998 when excessive thunderstorm rains closed several roads due to high water. In June 2000, localized flash flooding occurred as 2 to 3 inches of rain fell in less than two hours washing out county roads near North Bend, WI. And in July 2008, rounds of thunderstorms one evening led to extensive flooding and the closure of many roads around the county.

Flash Flood Warnings	
Year	
2010	1
2009	2
2008	1
2007	0
2006	0
2005	0
2004	0
2003	0
2002	0
2001	0

Black River @ Black River Falls, WI Top 5 Crests (FS: 47 feet)	
Date	Crest
9/24/2010	61.46'
6/20/1993	61.19'
6/27/1998	55.63'
4/7/2001	52.08'
6/2/2000	50.94'

The Black River bisects Jackson County from north to south that includes two dams – Hatfield and Black River Falls (see photo below). Headwaters for several other rivers begin in the county as well, including the Buffalo and Trempealeau Rivers. These rivers can experience flooding with seasonal spring snowmelt but may also rise quickly during the summer from heavy rain patterns. Other creeks and flowage areas can run high after periods of heavy rain, although problems in eastern parts of the county are rare given the sparse population and amount of lowlands. Lake Arbutus borders Clark County but water levels are controlled by the Hatfield Dam.

In September 2010, two days of heavy rain, including over 7" at Black River Falls, produced record flooding up and down the Black River basin. Damage was limited to areas near the river but a Federal disaster declaration was reached for much of western Wisconsin due to the flooding. (see below)

Record flooding also occurred in 1993 when months of rain hit the upper Midwest. Debris build up along the spillway at the Hatfield Dam led to damage and flooding while down river in Black River Falls over 100 homes were flooded due to a levee failure. Fifteen roads were also closed in the area.

Photo courtesy of OxBlue

Winter Storms and Extreme Cold

Hazardous winter weather can bring a variety of conditions to Jackson County. Since 1982, an average of 3-4 winter storms impact the area each season. The terrain in the county does limit the number of true blizzards (only 2 since 1982) but heavy snow, blowing snow, ice, and sleet all occur. There have been a total of 4 documented deaths and 49 injuries as a direct result from winter storms in Wisconsin since 1982.

The 30-year average seasonal snowfall at Hatfield, WI is 41.9 inches. The bulk of snow falls between December and March. The largest winter storms tend to form over the central or southern Plains, then move northeast towards the western Great Lakes.

Some of the largest two-day winter storms include 18.0 inches on December 2-3, 1985 and 17.0 inches on January 4-5, 1971. A blizzard on December 8-9, 2009 produced 15.0 inches of snow at Taylor, WI and 12.1" at Black River Falls.

March can often be a snowy month. Even though snowfall may be less frequent, heavy wet snow can form from large spring storms. The all-time record one-day snowfall in Hatfield is 20.0 inches which has been set twice - March 19, 2005 and March 6, 1959.

Top 5 Seasonal Snowfalls at Hatfield, WI

Years	Snowfall
1951-52	94.7"
1950-51	91.6"
1961-62	68.8"
1942-43	67.6"
1936-37	65.7"

Ice storms (1/4" of ice or more) can occur but are relatively rare with only 7 occurrences since 1982.

Arctic cold outbreaks can occur in the upper Midwest as well. Snow depth can modify these cold temperatures leading to sub-zero readings on average 31 times a winter. Occasionally strong northwest winds will combine with arctic outbreaks to create dangerous wind chill conditions as well. The coldest temperatures are usually in January and February with average lows in the single digits and record lows colder than -25°F most days. The all-time record low at Hatfield, WI is -51°F set in 1951. Temperatures can get even colder in favored low areas – like cranberry bogs and flowages.

Coldest Lows at Hatfield, WI

Low	Date
-51°F	1/30/1951
-51°F	2/1/1918
-48°F	2/20/1929
-47°F	1/15/1963
-46°F	1/24/1922

In January 1912, Hatfield, WI went 14 days with temperatures at or below +5°F, with low temperatures of -35°F, -38°F, -42°F, and -43°F. January 1936 was also a brutally cold month with low temperatures during the last half of the month at or below -8°F, including four consecutive days below -30°F.

The La Crosse National Weather Service issues Wind Chill Advisories when wind chill readings of -20°F to -34°F are expected. Wind Chill Warnings are issued when wind chill values at or below -35°F are expected or occurring. In January 2009, wind chills reached -34°F in Jackson County during a 3-day cold spell.

Heat, Drought, and Wildfires

On occasion the weather pattern across the upper Midwest favors prolonged heat and humidity, leading to heat waves. June through August are the warmest months with average high temperatures in the 80s and record highs above 100°F most days. The warmest temperature on record at Hatfield, WI is 108°F which was set on July 14, 1936.

Warmest Highs at Hatfield, WI	
High	Date
108°F	7/14/1936
107°F	7/13/1936
106°F	7/15/1995
105°F	7/12/1936
105°F	5/31/1934

Since 1982, there have been 115 fatalities directly related to heat waves and another 95 indirectly, in Wisconsin. In Jackson County, there have been 13 heat waves since 1982.

One of the longest heat waves on record occurred in July 1936 when Hatfield, WI hit 95°F or higher for 13 consecutive days, including 9 consecutive days at or above 100°F and all-time record highs four days in a row. In more recent years, high temperatures reached at or above 100°F four days in a row in late July and early August 1988.

Prolonged dry spells can also lead to drought causing extreme damage to crops. Droughts vary in length and intensity but abnormally dry to moderate drought conditions can occur quite frequently. Severe to extreme droughts occur far less frequently.

Dry weather can also lead to a wildfire threat, especially in the spring (April) before foliage has emerged (i.e. before green up) or in the fall after vegetation has started to die off. Warm, dry (i.e. lower relative humidities), and windy conditions all favor higher fire danger and can lead to sporadic fires in Jackson County. Thick, wooded areas, especially areas of Jack Pines, pose a threat for wildfires with a well known history in this part of the state.

On April 27, 1977, a forest fire started south of Black River Falls and quickly became a raging crown fire, traveling through the tops of the dense pine forest. In 12 hours, a total of 14 homes and 17,590 acres of forest land had burned although the village of Millston was spared because of a last minute wind shift. In April 1994, 720 acres burned near Black River Falls when warm temperatures and gusty winds combined to yield an active period of wildfires in the state.

Local Climatology

Here are some basic climatology figures for the Jackson County area. Data is valid for Hatfield, WI based on normals from a 30-year period (1971-2000).

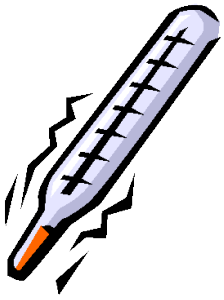
Month	Normal Maximum Temperature	Normal Minimum Temperature	Average Temperature	Precipitation	Snowfall
JAN	22.5	+0.5	11.5	1.12”	9.2”
FEB	29.7	5.2	17.5	1.03”	7.6”
MAR	41.8	18.4	30.1	2.00”	8.2”
APR	56.7	30.9	43.8	2.87”	1.9”
MAY	69.1	41.7	55.4	3.66”	0.0”
JUN	77.4	51.7	64.6	4.58”	0.0”
JUL	80.9	56.6	68.8	4.62”	0.0”
AUG	78.6	54.8	66.7	4.30”	0.0”
SEP	70.7	44.6	57.7	3.51”	0.0”
OCT	59.5	34.3	46.9	2.32”	0.1”
NOV	41.0	20.8	30.9	2.18”	3.7”
DEC	26.7	7.6	17.2	1.36”	10.5”
Year				**33.55”**	**41.9”**

Note: Climatological information for Hatfield, WI began in 1896 but there are numerous periods of missing data. Information for Black River Falls is limited to precipitation only.

Miscellaneous facts:

- Warmest year(s) on record – 1931 (48.9°F)
- Warmest month on record – July 1936 (76.3°F)
- Warmest day on record – July 14, 1936 (108°F)
- Greatest number of days with 90°F or warmer – 1988 (51 times)

- Coldest year on record – 1924 (39.9°F)
- Coldest month on record – January 1912 (-6.3°F)
- Coldest day on record – January 30, 1951 (-51°F)
- Greatest number of days at 0°F or colder – 1978 (63 times)



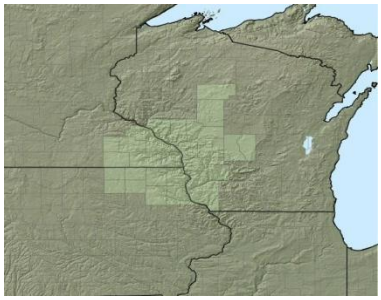
- Wettest year on record – 1911 (49.61”)
- Wettest month on record – June 1993 (12.14”)
- Wettest day on record – July 13, 1912 (5.40”)
- Driest year on record – 1948 (18.55”)
- Driest month on record – Numerous (0.00”)

- Highest seasonal snowfall on record – 1951/52 (94.7”)
- Highest monthly snowfall on record – March 1956 (39.0”)
- Highest one-day snowfall on record – March 19, 2005 and March 6, 1959 (20.0”)
- Least seasonal snowfall on record – 1967/68 (10.4”)

NOAA/National Weather Service Support and Weather Monitoring

NOAA's National Weather Service (NWS) forecast office at La Crosse, WI serves Jackson County with weather information and support on a continuous basis. Operating 24 hours a day, a staff of 23 issues routine and non-routine informational products for the area, including all watches, warnings, and advisories related to natural hazards. Doppler radar (WSR-88D) is co-located with the La Crosse NWS office and covers the region.

NWS La Crosse has a web site at: www.weather.gov/lacrosse



Normal communication during hazardous weather scenarios is via telephone with limited use of amateur radio.

NOAA Weather Radio coverage in Jackson County includes:
- WNG564 (Black River Falls) on 162.500 MHz
- WXJ86 (La Crosse) on 162.550 MHz

Storm spotter groups consist of mainly amateur radio operators and the general public, with some involvement from law enforcement and fire departments, among others. Spotter training is held nearly every year with an average attendance in the past 5 years of 27.

There are a variety of weather monitoring sources in or near Jackson County, including:

Automated weather station(s):
- None

River Gauge(s):
- Black River @ Hatfield Hydro Plant
- Black River @ Black River Falls

Cooperative Observers
- Black River Falls
- Mather 3NW

In addition, numerous volunteer reports from around the county are received at the La Crosse NWS office including rainfall, snowfall, and temperatures, on a routine basis.

Resources

National Weather Service – La Crosse	www.weather.gov/lacrosse
NWS La Crosse Tornado Database	www.weather.gov/lacrosse/?n=tornadomain
NWS La Crosse River Monitoring	http://www.crh.noaa.gov/ahps2/index.php?wfo=arx
NWS La Crosse Climate	www.weather.gov/climate/index.php?wfo=arx
NWS La Crosse Drought information	www.weather.gov/lacrosse/?n=drought
NWS La Crosse Storm Summaries	www.weather.gov/lacrosse/?n=events
NWS La Crosse NOAA Weather Radio page	www.weather.gov/lacrosse/?n=nwr
NWS La Crosse Severe Weather Climatology	www.weather.gov/lacrosse/svr_climate.php
NWS Storm Prediction Center	http://www.spc.noaa.gov/
SPC Online Severe Weather Climatology	http://www.spc.nssl.noaa.gov/climo/online/grids/ http://www.spc.noaa.gov/climo/online/rda/ARX.html

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Last Updated: November 2010